

Complementary Courses: the Public Works Management for Civil Engineers and the Entrepreneurship for Engineers, at the University of Florida

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Abstract

Civil engineers need to understand in several skills to work with both public and private organizations. Civil engineering works in private practice include planning, designing, constructing as well as operating physical facilities, and in public practice involve city or regional planning and layout construction of highways. At the University of Florida, two graduate courses are examined: Public Works Management for Civil Engineers introduces civil engineering graduate students to the concept of public works by giving an overview of public works organizations, communications, equipment management, finance, planning issues, water resources, solid waste management as well as legal aspects. In addition, Entrepreneurship for Engineers aims to educate graduate students and select upper level undergraduate students about the concepts and practices of entrepreneurial thinking which major course themes include an introduction to entrepreneurship, idea generation and feasibility analysis, and business planning.

The complementary relationship of the courses can link civil engineering students to better understand the overall knowledge using similar methods of combination of lectures, case studies, student-led discussions, teamwork and guest speakers. However, the courses provide the different contents of government and private sectors in various aspects. The classes teach real life skills that civil engineering students can use in their future careers.

Introduction

The Department of Civil Engineering at the University of Florida, which was established in 1905, has been a recognized leader in original educational programs and is widely considered to be among the top programs in the United States. A department with a strong emphasis on social consciousness, UF's Civil Engineering Department continues to graduate men and women who make outstanding contributions to the public through business, industry, education, and government. The linkage between the Public Works Management for Civil Engineers and Entrepreneurship for Engineers causes is discussed in terms of course description and practice of the civil engineering aspects¹.

Public Work Management for Civil Engineers

The Public Works Management for Civil Engineers course goals to introduce students to public works by giving an overview of public works organizations, communications, equipment management, finance, planning issues, water resources, solid waste management, and legal aspects involved in public works. The objective is to help students understand the definition of public works and how civil engineers manage public works organizations; develop leadership and communication skills, which are basic requirements of any manager; be able to understand the financial aspects concerning public works activities; apply knowledge gained from previous civil engineering courses to solve public works engineering problems; study legal aspects in public works; and understand fleet management, building the grounds, street and highways, traffic, solid waste, water supply and future issues in infrastructure. We will see the course content in Table 1².

This course teaches students the basic concepts of managing public works organizations, leadership qualities and the art of communicating with different people within these organizations. The students also learn about financial and legal aspects involved in public works and identify public works problems and how to determine possible solutions².

In the learning process, the instructor facilitates students to discuss topics relating to the content. Guest speakers, who succeed in public practices, come to share and contribute their experiences. Moreover, teamwork assignments and visiting public organizations in the city illustrate the real life skills to the class.

Entrepreneurship for Engineers

The University of Florida Entrepreneurship for Engineers course is designed to introduce graduate and select upper level undergraduate students to the concepts and practices of entrepreneurial thinking. Using a combination of lectures, case studies, student led discussions, team business plans, and investor presentation formats, the course teaches life skills in entrepreneurial thought and action that students can utilize in careers ranging from starting companies to initiating R&D projects in large company entrepreneurial endeavors. Major course themes include: Introduction to Entrepreneurship, Idea Generation and Feasibility Analysis, and Business Planning. The table 1 also shows the content of the course³.

Course objectives include exploring the entrepreneurial mindset and culture that has been developing in companies of all sizes and industries; examine the entrepreneurial process from the generation of creative ideas to exploring feasibility to creation of an enterprise for implementation of the ideas; experience the dynamics of participating on a business team and the power inherent in a team relative to individual effort; create and present a business plan for a technology idea; and provide the background, tools, and life skills to participate in the entrepreneurial process within a large company, in a new venture, or as an investor³.

Course Overview: Entrepreneurs have started new ventures for generations. Success was more a function of insistence and a measure of how good was the idea behind the business. In the past, however, errors in the structure and early manner of the enterprise could be overcome with time through learning. In the new standard though, tolerance for such errors is acutely narrow. Competition has become intense, technology-based, market-focused and highly competent³.

In such a competitive environment the lack or misuse of the application of currently available technology to the structure and conduct of a new business could quickly bring its end. Similarly, the inability to adapt the enterprise to the appearance of new technologies to make it market-driven and structure-perfect could have the same effect. In summary, when competition is just too tough, the end could quickly come³.

An entrepreneurial orientation is the common denominator among successful enterprises in this new standard. The elements frequently key to successful competition include a team approach to management focusing on enterprise value rather than individual recognition, structuring an environment that promotes seeking and exploiting opportunities rather than recognizing and solving problems, conceptualizing and committing to new markets rather than being constrained by traditional boundaries, and balancing intelligent risk and the opportunity for rapid advancement⁴.

Organizational size neither offers a safe harbor nor increased risk. New ventures exist either as new, small businesses or as elements of large organizations. Large companies have become competitive in this new standard by redefining their cultures. Decision-making has been shifted downward in these companies to encourage quick reaction to market opportunities⁴.

Every student that plans to work, therefore, will face the need to negotiate these new realities, whether it will be in a big company, small company, new company or old. The goal of this course is to provide the background necessary to understand the entrepreneurial approach to business and the tools required to function effectively in that environment³.

The course is organized around lectures, readings, class discussion and a team project. Students form into teams for the purpose of developing a venture idea into an early stage business plan and presenting that plan. The tasks for each team are individual elements and an executive summary of their plan and a team presentation of the plan to the class. The final consists of an individual assessment of an entrepreneurial case study³.

Linkage

In engineering, course requirements often include a product design and engineering project which involves bringing together students from different disciplines or roles including engineering design, material specification and testing, design for manufacturing, marketing, process or production control and product testing. The goal is a new product design with optimum durability, cost, consumer appeal, and performance².

In business school, however, the project is often a business plan which includes preparation of a new business or product that involves students assessing product specifications, product engineering, and manufacturing, financing and cash flow requirements, market strategy and execution, operational plan, business structure, and all the interrelated issues of planning a business launch, operation, and evolution³.

While schools and universities are organized around the goal of assessing individual performance, in the world of work an individual's career is often dramatically affected by how the work unit succeeds or fails. Often the success or lack of success is determined by the ability to integrate or incorporate the skills and requirements of different disciplines into a single plan or work product. Well-rounded knowledge is important⁵.

Table 1: Content of the complementary courses^{2,3}

Public Works Management For Civil Engineers	Entrepreneurship for Engineers
<ul style="list-style-type: none"> • What is Public Works? • Public Works Organizations • The Challenge of Managing Infrastructure • Life-Cycle Analysis in planning and Design • Framework for Infrastructure Management • Information Systems • Managing People • Communication Management • Public Works Finance • Purchasing • Database Management, Data Needs, Analysis • In-Service Monitoring and Evaluation Data • Legal Aspects of Public Works • Engineering and contract management 	<ul style="list-style-type: none"> • Idea and Opportunity Generation • Sources of Opportunity • Creativity • Introduction for Entrepreneurship • Feasibility Analysis • Attribute and Myths of Entrepreneurs • The Original and Evolution of New Business • The Mind Set of the Entrepreneur Leader • Business planning and the Value Proposition • Business Plan • Financial-- Balance Sheet and Cash Flow Analysis • Company Valuation and Deal Making • Intellectual Property • Building a Winning Management Team

Table 1 presents the content of these complementary courses. Although the courses focus on different practices -- public or private, the content and teaching method flow in a similar pattern. Both courses help students to understand the meaning of the organizations, to develop their personal ability and thinking to the concepts, and to have some tools such as how to do the business plan or public works finance for their future works^{2,3}.

As civil engineering students, they should know the overall knowledge in public and private organizations because no matter organizations they will work for, they would apply both sides of the knowledge to cooperate with people in the projects and understand how to work in the sense of win-win interaction^{2,3}.

Offering these two courses at the graduate level to engineering students at the university have formed a challenge in the city to have close connections between the university engineering school, business school and local entrepreneurs. Entrepreneurs do not often have the resources and higher paying initial jobs that get the attention of administrators and students. Yet startup and early stage technology-based firms are often exciting and learning places to work because each person often has to master different business functions -- product development, marketing, finance, production, even business planning⁵.

The state of Florida is one of many states that have, through research parks, incubators, applied research institutes, or just co-location of industry R&D labs near campus, created opportunities for technology researchers, entrepreneurs, and business assistance providers to produce faster rates of innovation and technology development than could be expected from individual inputs of talent, capital, and local resources⁵.

In terms of the broader issue of increasing the integration of skills, students can have a chance to practice in both public and private sectors through the courses and the connection between the university and organizations have been built. Though, the definition of the two other criteria, teaching and research, are fairly standard and well understood. But public service can mean work with Floridians outside the university, service to national professional organizations, or internal governance work. A broad degree of latitude of interpretations would be a meaningful measure for judging hiring and promotion⁵.

Conclusion

At the University of Florida, two graduate courses are examined: Public Works Management for Civil Engineers and Entrepreneurship for Engineers. Although the courses focus on different practices -- public or private, the content and teaching method show in a similar pattern by using the combination of lectures, case studies, student-led discussions, teamwork and guest speakers. The linkage between these two complementary courses will help the civil engineering students to better understand both government and private sectors. The courses teach real life skills that students can use in their future careers. It is a challenge for graduate students to have a capability to see and improve the socioeconomics of the state.

Bibliographic Information

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Biographical Information

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